

NON-PUBLIC?: N  
ACCESSION #: 9010220257  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Duane Arnold Energy Center PAGE: 1 OF 03

DOCKET NUMBER: 05000331

TITLE: Reactor Scram on Three Main Steam Lines Less Than 90% Open Due to  
Loose Electrical Connection Coincident With Surveillance Test  
Performance

EVENT DATE: 09/18/90 LER #: 90-016-00 REPORT DATE: 10/12/90

OTHER FACILITIES INVOLVED: None DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 050

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Jeff Axline, Technical Support TELEPHONE: (319) 851-7600  
Engineer

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:  
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On September 18, 1990, with the plant operating at approximately 50% power, a reactor scram occurred when three inboard Main Steam Isolation Valves (MSIVs) closed unexpectedly. Just prior to the MSIVs closing, the 'A' side of the Main Steam Line Radiation Monitor (MSLRM) surveillance test had been satisfactorily completed with isolation signals reset. Upon initiating the 'B' side test, the 'B', 'C', and 'D' inboard MSIVs closed resulting in the scram.

The cause of this event was a loose wiring connection in the inboard MSIV control logic which effectively put the 'B', 'C', and 'D' inboard MSIVs in a half (A side) tripped condition (AC solenoids de-energized) even though the logic was reset. During performance of the MSLRM surveillance, when the 'B' logic trip was inserted, the DC solenoids on

the inboard MSIVs de-energized causing the 'B', 'C' and 'D' inboard valves to go closed.

Immediate corrective actions were to repair the connection and perform an extensive inspection of appropriate control room panels for additional loose connections. Long term corrective action will involve periodic inspections of appropriate panels.

This event had no effect on the safe operation of the plant. Safety systems responded as designed in response to the scram signal and the plant was quickly brought to a stable condition.

END OF ABSTRACT

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## I. DESCRIPTION OF EVENT:

On September 18, 1990, with the plant operating at approximately 50% power, a reactor scram (EHS System Code JC) occurred when three inboard Main Steam Isolation Valves (MSIVs) (SB-MSV) closed unexpectedly. The scram automatically initiated at 01:31:52 in response to the MSIV closure to less than 90% open on three of four main steam lines (EHS System Code SB). Just prior to the MSIVs closing, the 'A' side of the Main Steam Line Radiation Monitor surveillance test had been satisfactorily completed. Performance of the test causes a Primary Containment Isolation System (PCIS) (EHS System Code JM) half Group I (MSIV) isolation signal. The signal had been reset prior to proceeding to the 'B' side of the test. Upon initiating the 'B' side test, the 'B', 'C', and 'D' inboard MSIVs closed resulting in the scram.

## II. CAUSE OF EVENT

The inboard MSIVs are each controlled by two solenoids on a single valve. One AC solenoid which is controlled by the 'A' isolation logic and one DC solenoid which is controlled by the 'B' isolation logic. Both the AC and DC solenoids must de-energize to cause an MSIV to close. During investigation of the event, it was determined that the power (EHS System Code EF) which feeds the AC solenoids is wired in a daisy chain format. Inspection of the connections in the daisy chain identified a loose connection at HS-4415A (SB-HS), the handswitch associated with the 'B' inboard MSIV. A reduction in voltage to this point due to the loose connection caused 'B', 'C', and 'D' inboard MSIV AC solenoids to de-energize, effectively putting the 'B', 'C', and 'D' inboard MSIVs in a half (A side) tripped condition even though the logic was reset. (NOTE: MSIV SOLENOID ENERGIZED LEDs were verified to be lit after resetting trip

logic and prior to proceeding to the 'B' side of the surveillance test. This indicates that the AC solenoids de-energized after the LEDs were checked or enough voltage was available to light the LEDs but not energize the 'B', 'C', and 'D' AC solenoids.) The 'A' MSIV AC solenoid is wired prior to the loose connection in the daisy chain and therefore was unaffected by the loose connection. During performance of the Main Steam Line Radiation Monitor surveillance, when the 'B' logic trip was inserted, the DC solenoids on the inboard MSIVs de-energized causing the 'B', 'C' and 'D' inboard valves to go closed.

The cause of the loose connection could not specifically be identified, however, it appears that vibration during panel modifications and general modification work within the panel may have been contributing factors over a period of time.

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### III. CORRECTIVE ACTIONS:

Immediate corrective actions for the loose connection on HS-4415A were to initiate a maintenance request to replace the loose spade lugs with ring lugs. In addition, an extensive inspection of appropriate control room panels was performed to check for additional loose connections. As a long term corrective action, appropriate control room and plant panels will be periodically inspected for loose connections via the Preventive Maintenance Program.

### IV. EFFECT ON SAFE OPERATION:

This event had no effect on the safe operation of the plant. All rods fully inserted in response to the scram signal. Shortly following the scram, vessel level decreased due to core void reduction as expected to approximately 157 inches. Reduction of level below 170 inches caused Group II-V PCIS isolations to occur as designed. No automatic Emergency Core Cooling System (ECCS) actuations occurred or were required as vessel level was maintained well above 119.5 inches (the point at which ECCS systems initiate) with feedwater (EHS System Code SJ). As Group I isolation logic had not been completed and a Group I isolation was not required, the 'A' steam line was not manually closed. This greatly improved the operators' ability to control vessel pressure and dissipate residual heat. Safety Relief valve actuation was not required to maintain pressure within acceptable limits.

A full Group I isolation as well as a single MSIV closure are analyzed events without unacceptable safety consequences. As this event had only three of four main steam lines close, it is considered a subset of these

analyzed events and therefore would have no effect on the safe operation of the plant under any operating conditions.

## V. ADDITIONAL INFORMATION

A review of plant history did not identify any previous events in which a loose electrical connection resulted in a reactor scram. The review did identify one scram which occurred due to loose mounting screws on a Reactor Protection System (RPS) relay auxiliary switch. In addition, two LERs (87-027, 90-008) and five Deviation Reports associated with loose electrical connections were identified. None of these had significant consequences.

This report is being submitted pursuant to 10 CFR 50.73(a)(2)(iv).

ATTACHMENT 1 TO 9010220257 PAGE 1 OF 1

Iowa Electric Light and Power Company

October 12, 1990  
DAEC-90-0839

Mr. A. Bert Davis  
Regional Administrator  
Region III  
U. S. Nuclear Regulatory Commission  
799 Roosevelt Road  
Glen Ellyn, IL 60137

Subject: Duane Arnold Energy Center  
Docket No: 50-331  
Op. License DPR-49  
Licensee Event Report #90-016

Gentlemen:

In accordance with 10 CFR 50.73 please find attached a copy of the subject Licensee Event Report.

Very truly yours,

Rick L. Hannen  
Plant Superintendent - Nuclear

RLH/JSA/sjo

cc: Director of Nuclear Reactor Regulation  
Document Control Desk  
U.S. Nuclear Regulatory Commission  
Mail Station P1-137  
Washington, D. C. 20555

NRC Resident Inspector - DAEC

Dr. William R. Jacobs, Jr.  
GDS Associates, Inc.  
Suite 720  
1850 Parkway Place  
Marietta, GA 30068-8237

File A-118a

General Office P.O. Box 351 Cedar Rapids, Iowa 52406 319/398-4411

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